

MOBILETT Plus/ Plus E

SP

Installation and Start-up Instructions

From Serial No.

MOBILETT Plus	3200
MOBILETT Plus E	10900

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Chapter	Page	Revision
All	All	01

Document revision level

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Training of field service engineers

Due to the technology, used in this equipment, the setup, service and maintenance is only allowed to be performed by a field service engineer with a Work Permit for MOBILETT Plus.

Text emphasis

 DANGER	DANGER indicates when there is an immediate danger that leads to death or serious physical injury.
 WARNING	WARNING indicates a risk of danger that may lead to death or to serious physical injury.
 CAUTION	CAUTION used with the safety alert symbol indicates a risk of danger that leads to slight or moderate physical injury and/or damage to property.
NOTICE	NOTICE used without the safety alert symbol indicates a risk of danger that if disregarded leads or may lead to a potential situation which may result in an undesirable result or state other than death, physical injury or damage to property.
NOTE	NOTE contains information provided with special emphasis to facilitate proper use of the equipment or proper execution of a procedure, i.e. hints, tips.

Symbols



Checks and adjustments that must be performed with radiation ON are identified by the radiation warning symbol.



This symbol means "Dangerous voltage".



Checks marked with this symbol are to be entered into the test certificate at the end of these instructions.



This symbol means "Attention, consult the documentation".

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Several of the sections in these instructions are for the USA only. These sections are identified with this symbol.



Sections marked with this symbol have been included in the Siemens Training Video (part of the self-study packet), which can be ordered through Siemens customer service.



This symbol indicates components sensitive to Electro-Static Discharge (ESD).

Required documents

- Instructions for Use SPR8-220.201...
- Service Instructions SPR8-215.898...
- Installation Instruction SPR8-220.031.02...
Remote exposure switch system-optional
- Maintenance Instructions including DHHS... SPR8-215.831...

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Required tools, measurement and auxiliary devices

NOTE

All tools, measurement and auxiliary devices with the exception of those marked " * " , are listed along with their specifications in the STC (Service Tools Catalogue).



- Standard service equipment*
- Digital multimeter
- kV measurement device (works with the filter comparison method)
- Protective ground/earth meter
- Equivalent leakage current meter
- Storage oscilloscope with ± 2.5 % accuracy
- Dose meter

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Safety information and protective measures

⚠ CAUTION

- When performing service work and tests adhere to:
 - the product-specific safety information in the documents,
 - as well as the general safety information contained in ARTD Part 2.
- Connect the MOBILETT Plus/Plus E only to mains power supply outlet (receptacle) , that corresponds to the installation requirements of VDE 0107 or country-specific regulations.
- Remove or install boards only when the generator is switched OFF. Adhere to the ESD guidelines  .
- Checks and adjustments performed with radiation ON are identified by the radiation warning symbol  . During these types of adjustments, radiation protective clothing must be worn.

⚠ WARNING

- Never work with the system open if the capacitor is charging or has just charged.
- The capacitor bank may still be charged even if the system is switched OFF and the mains cable is disconnected. Life-threatening electric shock hazard exists.
To avoid danger, refer to the section entitled
“Protective measures when working on the capacitor bank”.

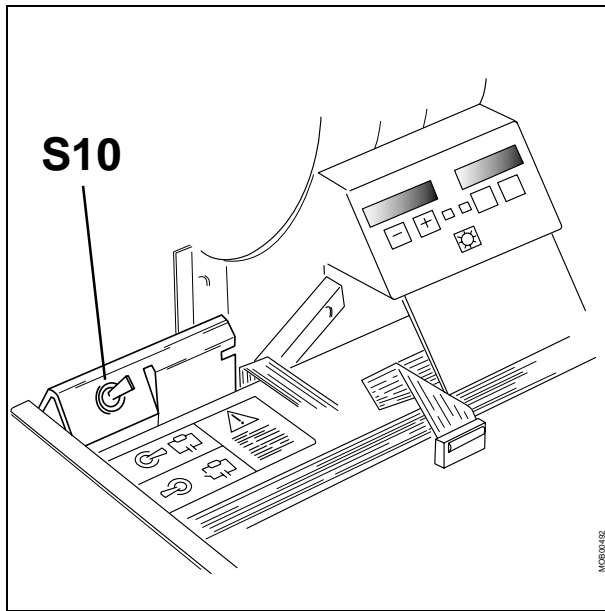


Fig. 1

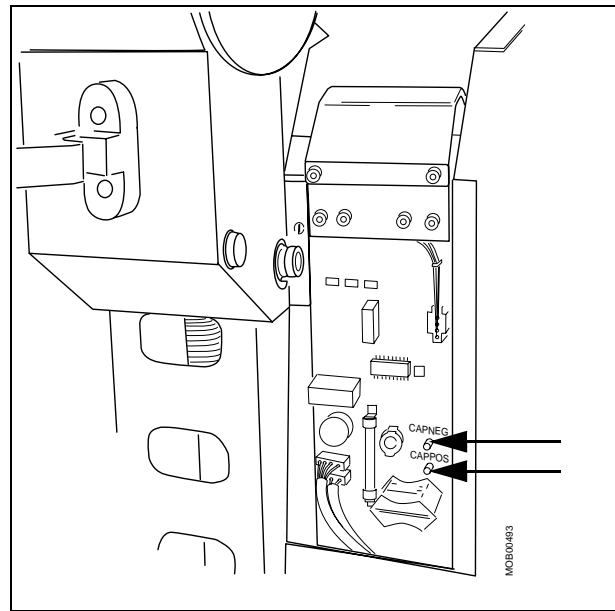


Fig. 2



Protective measures when working on the capacitor bank



Comply with the information given in this section, before opening the system.



⚠ DANGER

Never work with the system open if the capacitor is charging or has just been charged.

The capacitor bank may still be charged even if the system is switched OFF and the line voltage cable is disconnected. Life-threatening electric shock hazard exists.

Consult the information in this chapter.

- System OFF.
- Disconnect the mains cable.
- Remove the system upper cover.
- Discharge the capacitor bank with S10 (D7) (Fig. 1).
- Wait 5 minutes; then remove the left and right covers, and the cover with the cassette compartment.

- Measure the residual voltage at test points CAPPOS and CAPNEG on board D7 (Fig. 2). The voltage measured must be less than 10 V.

⚠ WARNING

If the voltage measured between CAPPOS and CAPNEG is 0V, the measurement device could be defective or the wires between the CAPPOS and CAPNEG test points on the capacitor bank could be damaged.

The capacitors could still be charged.

In this case, proceed as follows:

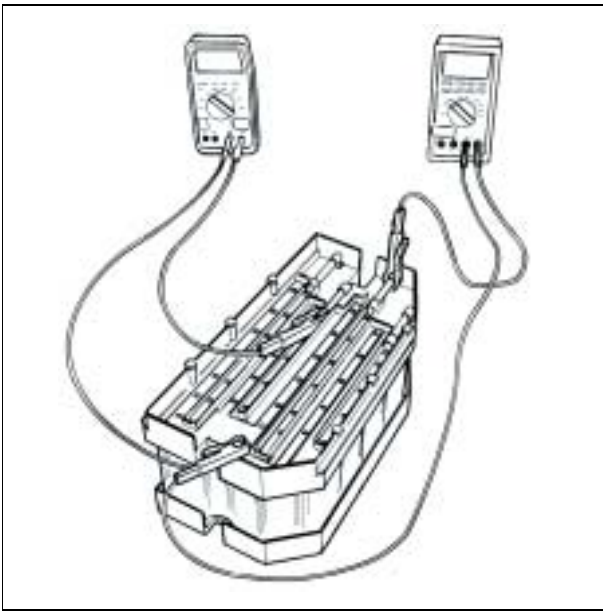


Fig. 3

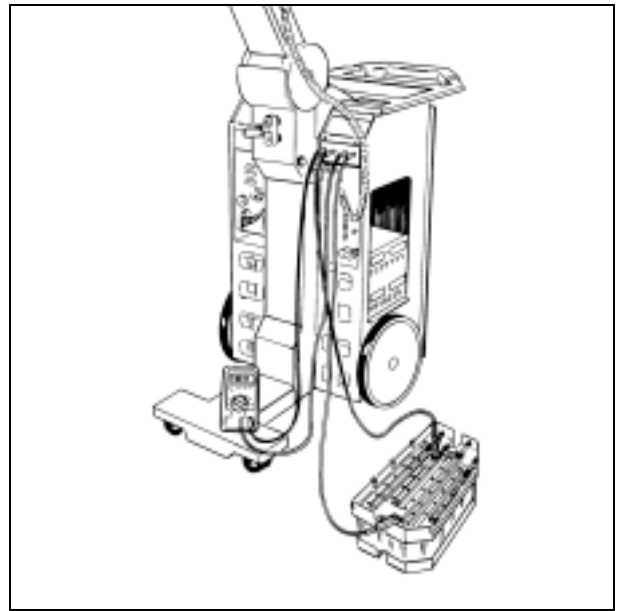


Fig. 4

- Make sure that the correct measurement range is set on the measurement device.
- Connect the measurement device to CAPPOS and CAPNEG.
- Switch S10 off. Connect the mains cable and switch the system ON.
- Check whether the voltage increases.
- Switch the system OFF, disconnect the mains cable and switch S10 on.
- Check whether the voltage decreases.
- If the measurement device indicates no voltage, check the measurement device.
- Measure the voltage for the capacitor bank at the bus bar. (Fig. 3).

⚠ WARNING

If the charging/ discharging does not function, the capacitor bank must be considered “charged”.

This means a risk of high voltage.

Use caution when performing measurements at the bus bar of the capacitor bank. Use only the specified measurement devices (350 V DC). If one of the fuses in the capacitor series has blown out, this series must be considered fully charged.

- Only use insulated tools when pulling out the capacitor units.

- Measure the capacitor bank voltage on the bus bar (Fig. 3).
- If one of the capacitor series of the capacitor bank is still charged ($U > 10 \text{ V}$), it can be discharged via resistor R103 on D7.
- Connect the voltmeter to the measurement points parallel to the insulated cables which will be used to discharge the capacitor bank ($U < 10 \text{ V}$) (Fig. 4).

General information

The MOBILETTs are mobile, mains-supplied X-ray units for intensive care units, neonatal departments and general X-ray rooms.

All exposure values can be chosen with free adjustment of kV and mAs data.

After start-up, country-specific tests are to be performed, if required;
e.g. acceptance test according to RöV (Germany-X-ray ordinance).

Acceptance test according to RöV (Germany):

Required measurements can be partially transferred from the test protocol provided.

Supply schedule

1 crate: L = 1360 mm
 B = 780 mm
 H = 1860 mm

Weight: gross approx	MOBILETT Plus	295 kg
	MOBILETT Plus E	283 kg

(Technical documents enclosed)

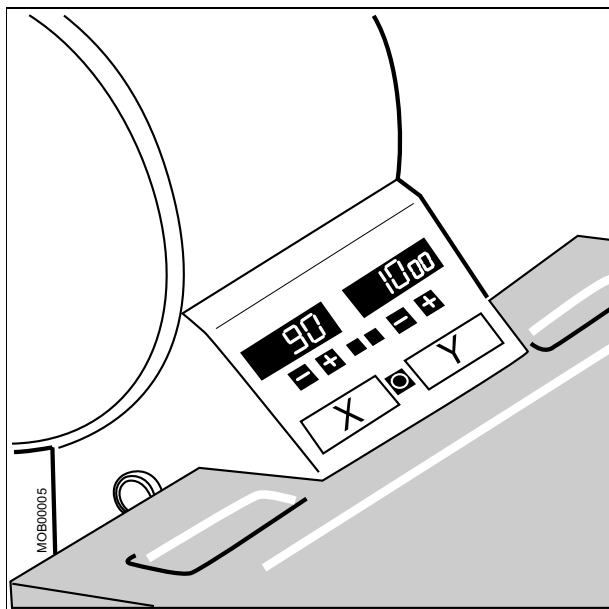


Fig. 1

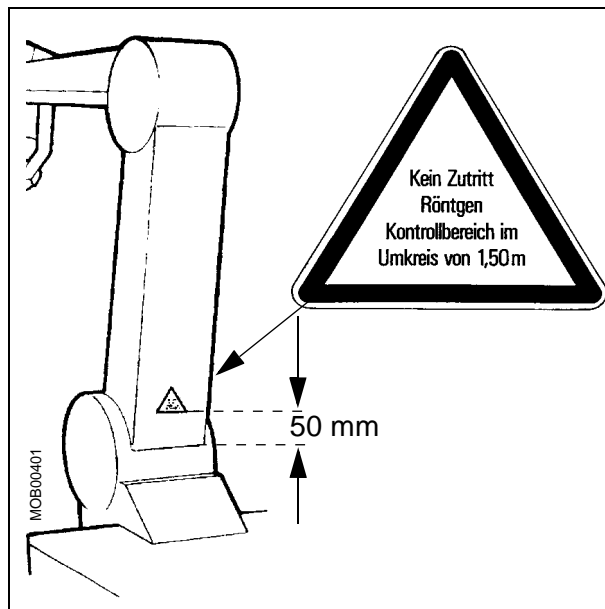


Fig. 2

Unpacking, applying warning labels



Important when unpacking:

Risk for serious damages due to humidity condensation or to high temperature inside the batteries.

Assure that the unit has established normal room temperature. The single tank temperature must be $>15^{\circ}\text{C}$ before startup.

- Fill in the LINA cards and return them to the addresses stated in the instructions on the cards.
- Unpack the protractor and place it on a proper place e.g. the column.
- Connect the exposure release cable.
- Mount warning label 60 77 411. Choose appropriate language version and paste it/them on the Control and display panel according to X, Y/ Fig. 1.
- Only in Germany:
Mount label 96 33 645 on the lower arm 50 mm above the link, see Fig. 2.

NOTE

If, due to increased operating loads (DIN 6815), there are other dimensions on site for the control range, appropriate labels can be ordered:

- Control range: 2.5 m, Part No. 84 14 823
- Control range: 3.5 m, Part No. 31 36 731

NOTE

The following label come in different languages. Pick the proper one and paste it according to Fig. 3.

Mount the other warning label 65 84 606 as shown in Fig. 3.

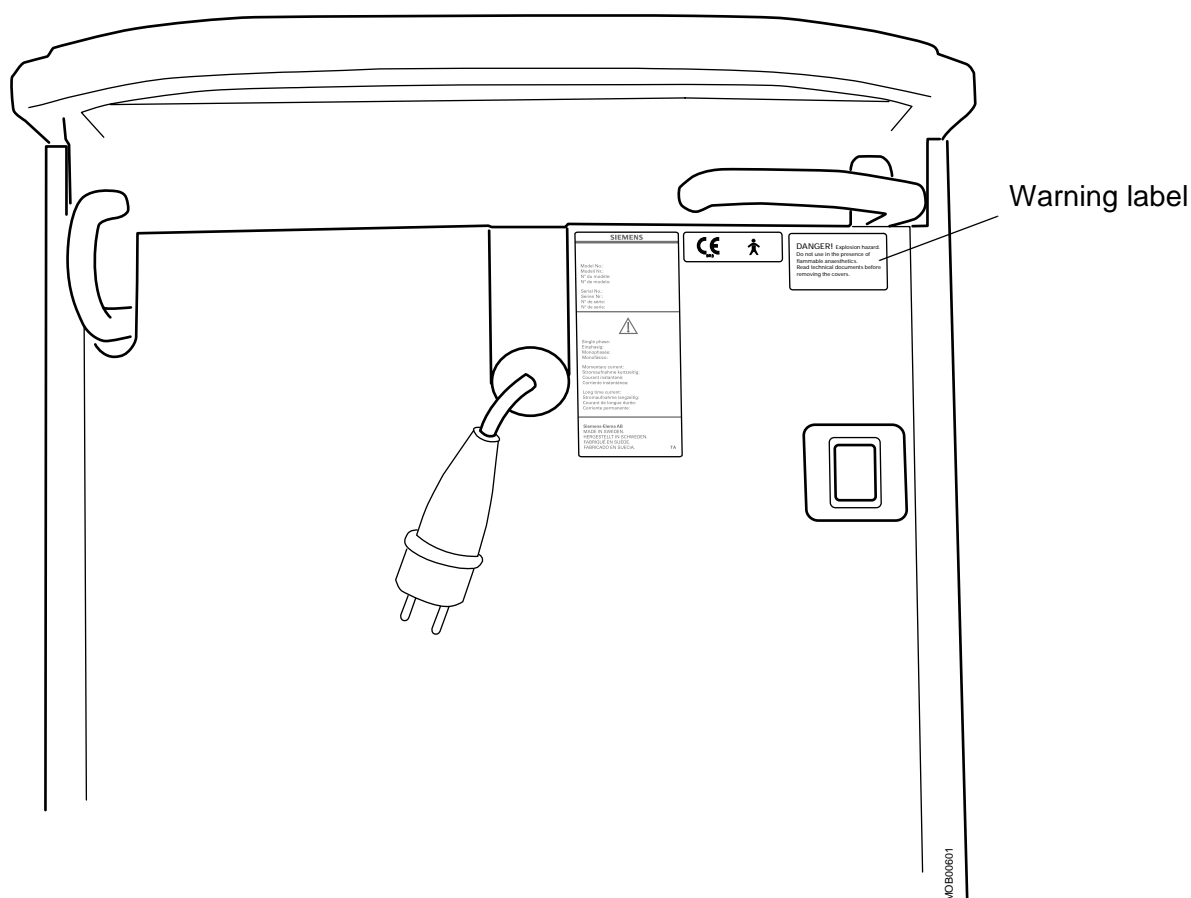


Fig. 3

- Check the unit for cracks, fractures or other damages.
- Make sure that neither the single tank nor the collimator has any mechanical defects which would impair the radiation protection.

This unit is provided with a 110 V hospital grade plug or a 230 V European plug. If the unit will be operated with a different voltage, the plug can be exchanged for a local standard grounding/earthing plug. For USA and Canada an UL/CSA approved mains cable and plug is installed. For Britain, the mains cable is equipped with an RCD plug.

If the operating voltage is changed from 110 V to 230 V or vice versa, the mains fuses U9 and U10 must be exchanged;

110 V - 130 V = 15 A

200 V - 240 V = 10 A

Only use approved types of fuses, see Spare part list.

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DHHS checks

The following measurements must be done according to "Maintenance Instructions including DHHS requirements".

- mAs accuracy
- Reproducibility



Labels

See Instructions for Use for adequate labeling.

Formation status



Initialization and capacitor formation selftest

- Connect the power supply plug and switch on the main switch.
 - ⇒ The MOBILETT runs a formation selftest during startup.

NOTICE

If the formation status is OK, the "Ready" light indicator lights up in approximately 2 minutes. Continue with chapter "Function check".



If error message "CAL 19" or "Err 17" appear on the display, see "Service instructions, section Capacitor formation".

Function check

If a malfunction occurs a message is indicated at the display, see "Service Instructions, chapter Display messages".

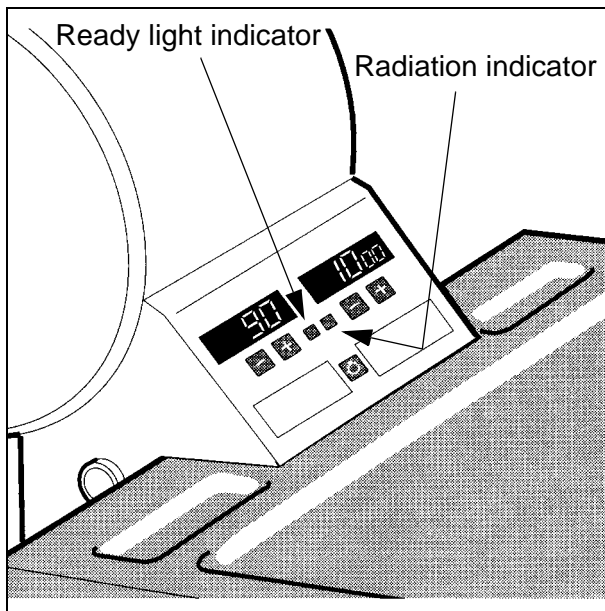


Fig. 4



Check the indicators and control buttons

- Check that the "Ready" light indicator lights green after approximately 2 minutes, see Fig. 4. If the "Ready" light indicator is not lit, a display message is shown on the display. See "Service Instructions, chapter Display messages".
- Select kV or mAs values by pressing the appropriate buttons. These values are indicated at the display. When changing the kV values, the "Ready" light indicator sometimes goes out while the generator adjusts to the new kV values.

NOTE

Pressing the button briefly increases/decreases the exposure value by one step. Holding the button depressed results in a continuous increase/decrease.

Functional test, cable winder

- Disconnect the power supply plug.
- Pull the left handle (for the cable winder) upwards.
- Move the cable up and down while rewinding it, in order to avoid any slack, until the cable is completely rolled up. Check proper function of cable winder and brake.
- Pull out the cable and connect the power supply plug.



kV and mAs indication, technique factors

- Confirm that the kV and mAs to be used during an exposure are indicated before the exposure begins and are visible from the operators position. Verify that all techniques factors are correctly indicated.



Radiation indicators

- Select 81 kV and 10 mAs.
- Make an exposure and confirm that the X-ray control console provides a visual indication whenever X-rays are produced and that a signal audible to the operator is present indicating that the exposure has been terminated.



Manual termination of exposure

The operator shall be able to terminate the exposure at any time during an exposure.

- Select:
 - MOBILETT Plus; 55 kV, 160 mAs.
 - MOBILETT Plus E; 55 kV, 80mAs.
- Make an exposure and immediately interrupt the exposure with the exposure release switch. A message, "USE 20", appears on the display indicating that the exposure release switch was released during exposure. It will also be indicated by 10 short beeps. The message can be acknowledged by pressing the kV + button.



Remote exposure switch system (optional)

- Check the function of the remote exposure switch system according to chapter functional check of "Installation Instructions: Installation of remote exposure switch system".

Adjustment, kV steps and upper kV / mAs limits

If the customer or local regulations asks for a limitation of the upper kV / mAs value, the service program P14 and / or P15 have to be executed. Program P14 is also used to set the kV steps as follows:

- MOBILETT Plus
 - 25 individual steps from 40 - 133 kV in whole exposure points
 - or 49 individual steps from 40 - 133 kV in half exposure points.
- MOBILETT Plus E
 - 24 individual steps from 40-125 kV in whole exposure points
 - or to 47 individual steps from 40-125 kV in half exposure points.
- Select Service Mode, see "Service Instructions, chapter Service programs".
- Select P14 (for kV steps and upper kV limit) or Select P15 (for upper mAs limit).
- Press lamp button to display actual kV limit / mAs limit.
- Press kV / mAs +/- button to change value.
- Press lamp button to store value and leave program.
- Switch "1" of S1 on D1 to "OFF".
- Check the chosen values.

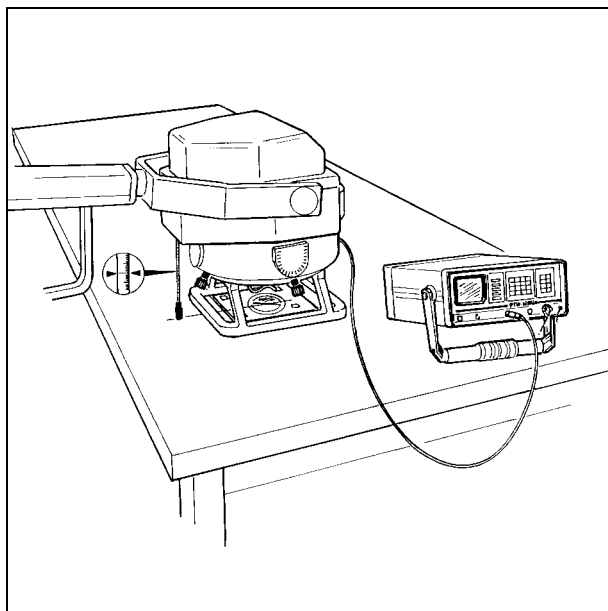


Fig. 5



Test of kV-accuracy

Requirement:

- The measured kV values, shall be within the limits stated in Fig. 6.

Required measurement devices:

- kV-meter, based on the filter-comparison method, for example PTW-Nomex kV meter. When measuring the kV non invasive a correction factor from the user manual of the kV-meter has to be used. If a kV meter is not available and if it is within local laws and regulations, the measurement can be made with an oscilloscope on D1. KVPEAK - D1 GND with a result of 40 kV/V.

NOTE

Higher filtration results in higher kV values.

- For the actual filtration of this MOBILETT, see the test protocol.

If the actual inherent filtration is unknown, the correction shall be made with a reference value of 5 mm Al.

- Put the kV meter into operation, see operating instructions for the kV-meter.
- Place the measurement detector on a table or other. Using the light field, set the detector in the beam projection, see Fig. 5.
- Set the SID to approx. 50 cm (20"). The SID may vary between different kV-meters.



- Set the following exposure parameters and release exposure:

kV Meter selection	Exposure parameter	Limit values* to be maintained
DC voltage	52 kV 50 mAs	49.0 - 55.0 kV
	81 kV 20 mAs	77.0 - 85.0 kV
	MOBILETT Plus 133 kV 20 mAs	MOBILETT Plus 126.4 - 139.6 kV
	MOBILETT Plus E 125 kV 20 mAs	MOBILETT Plus E 118.8 - 131.2 kV

Fig. 6

* The measurement inaccuracy of the respective measurement device must be subtracted from these limit values.

Adjustment

- To eliminate any deviations, see "Service Instructions, section P10 - Fast adaptation",

Check the arm- and single tank movement

- Check the arm systems and the single tanks up and down movements. The arm and the single tank should be easy to move and remain in desired positions. If this is not the case, see "Service Instructions, section Adjusting the friction linings".



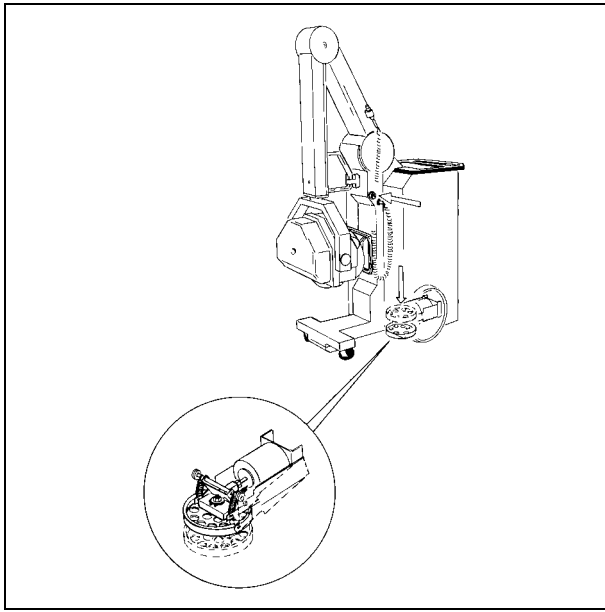


Fig. 7

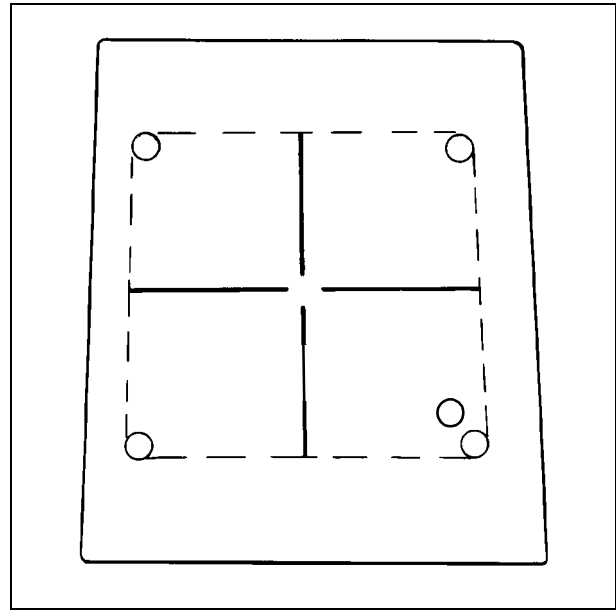


Fig. 8



Check the turn plate (MOBILETT Plus only)

- Push one of the turn plate buttons. The buttons must be lit when the turn plate is activated.
- Check that the unit can rotate around the turn plate, see Fig. 7.
- Push the turn plate button again and check that the turn plate goes back in parking position.
- Repeat the check with the other turn plate button. If any problem occurs, see "Service Instructions, section Adjustment and replacement of the turn plate".



Check the brake

- Lock the brake. It should not be possible to move the MOBILETT with normal hand effort. A slight skip is acceptable when using a force, greater than 350N.



Check the light field to X-ray field

- Load a 35x35 cm (14"x14") cassette with film.
- Put the cassette on a table or a similar repository.
- Set a SID of 100 cm (39"). Use the measuring tape.
- Switch on the collimator lamp and align the cassette. Now, collimate the light field to 25x25 cm (10"x10").
- Mark the four corners with coins and mark one of the corners with two coins, see Fig. 8.
- Set 52 kV, 2.0 mAs on the Control and display panel.
- Trigger an exposure.



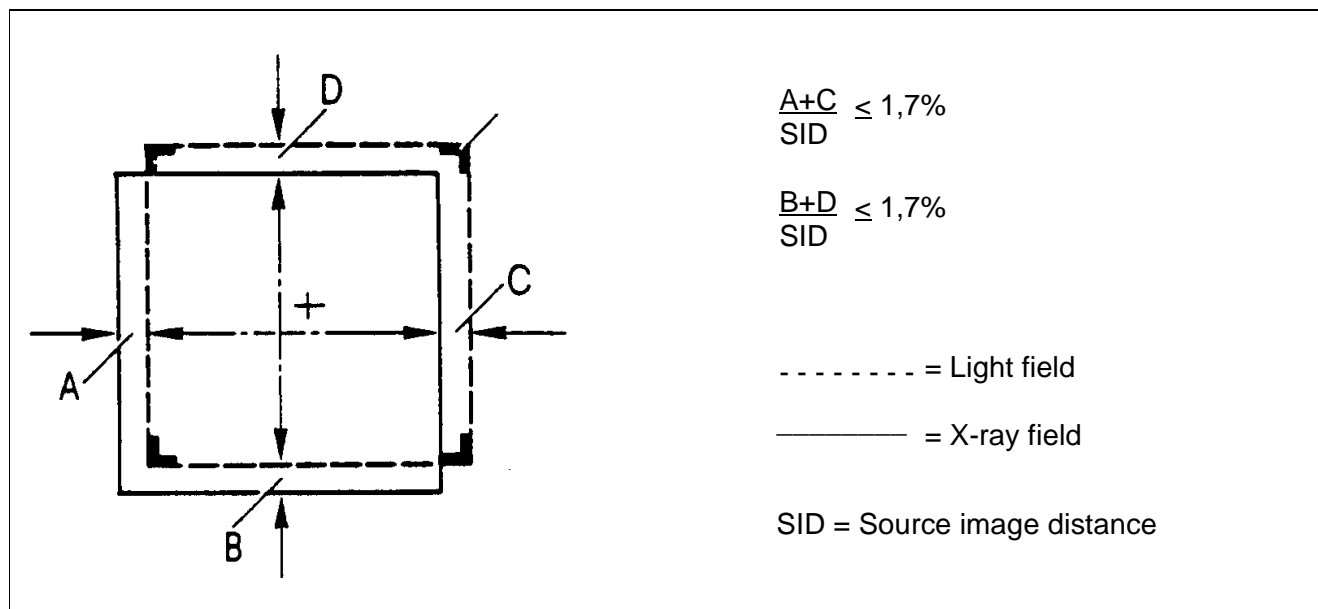


Fig. 9

- Process the film and measure the deviation between the light field and the X-ray field. Permissible deviation $\pm 1.7\%$ of the SID, see Fig. 9. If the deviation is greater, see "Service Instructions, chapter Replacement and repairs on the collimator".



Measurement of protective ground wire

Measuring instruments required: test instrument for protective ground wire

- Measure protective ground wire according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Resistance of protective ground wire ≤ 0.2 ohms.



Measurement of substitute leakage current

Measuring instruments required: test instrument for leakage current.

- Measure the substitute leakage current according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Value first measured

When the substitute leakage current is measured, a first measurement and so-called repeat measurements are carried out. It is the purpose of these repetitions to detect as early as possible any deviations from the value "first measured" and consequently changes in the safety structure of the system.

In the measurement of the first value, the **permissible maximum value of 2 mA** must not be exceeded.

The value "first measured" has to be entered in the test certificate at the end of the installation and setting instructions.

Repeat measurements

After a repair - if this becomes necessary due to the work performed - and basically always after maintenance, the substitute leakage current has to be measured again.

The value measured must not exceed the permissible maximum value of 2 mA. In addition, the value first measured must not be exceeded by more than 50%.

The results have to be documented.

List of compatible components

Component	Part No.
Single tank (new)	60 77 379 X037E
Single tank (repaired)	61 85 172 X037E
Collimator (new)	63 17 775 X037E

This test certificate is subdivided by analogy to installation and adjustment instruction.
This test certificate shall be completed in duplicate, one copy remaining with the client, the other to be filed at the branch office.

Part No./Type No./Serial No.:

Customer: **Customer No:**

Site/System Designation:

- ☐ Unpacking, Warning labels
- ☐ Labels
- ☐ Initialization selftest
- ☐ Capacitor formation
(Formation program used)
- ☐ Functional test, cable winder
- ☐ Check the indicators and control buttons
- ☐ kV and mAs indication, technique factors
- ☐ Radiation Indicators
- ☐ Manual termination of exposure
- ☐ Remote exposure switch system (optional)
- ☐ Test of kV-accuracy

Exposure values

Measured kV

	52 kV / 50 mAs
	81 kV / 20 mAs
Plus	133 kV / 20 mAs
Plus E	125 kV / 20 mAs

Measurement device

Type:
Serial No.:
Date calibrated:

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- ☐ Test of mAs-accuracy

Exposure values

Calculated mAs

	40 kV / 5 mAs
	81 kV / 2 mAs
Plus	133 kV / 10 mAs
Plus E	125 kV / 10 mAs

Measurement device

Type:
Serial No.:
Date calibrated:

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- ☐ Check for reproducibility
Fluctuation coefficient C:

**Measurement
device**

Type:

Serial No.:

Date calibrated:

- ☐ Check the arm- and single tank movement
- ☐ Check the turn plate (MOBILETT Plus only)
- ☐ Check the brake
- ☐ Light field relative to the x-ray field

$$\frac{(A+C) \times 100\%}{SID} = \dots\dots\dots \%$$

$$\frac{(B+D) \times 100\%}{SID} = \dots\dots\dots \%$$

- ☐ Protective ground: Ω

**Measurement
device**

Type:

Serial No.:

Date calibrated:

- ☐ Substitute leakage current: mA

**Measurement
device**

Type:

Serial No.:

Date calibrated:

Date: Technician: